Presumptive Medical Final Proposal

LEOFF Plan 2 Retirement Board

December 15, 2010

Issue

Law enforcement officers in LEOFF Plan 2 do not have any occupational illness & injury presumptions

Background Summary

- No law enforcement presumption in WA
- Federal presumption for heart and stroke
- Many states have law enforcement presumptions

Proposal Summary

- Create a presumption modeling the federal PSOB presumption
  - Heart & Stroke presumption for Law Enforcement
  - Stroke Presumption for Fire Fighters
- Retroactive to January 1, 2010

Proposal Summary

- **Law Enforcement Heart & Stroke presumption**
- Within 24 hrs nonroutine stressful or strenuous physical activity

- Law Enforcement
- Fire Suppression
- Rescue
- Hazmat Response
- Emergency Medical Services
- Prison Security
- Disaster Relief
- Other Emergency Response Activity
- Training
- Responding to an emergency

Proposal Summary

- **Fire Fighters Stroke Presumption**

- Within 24 hours of strenuous physical exertion due to firefighting activities

- Fire Suppression
- Fire Prevention
- Emergency Medical Services
- Rescue Operations
- Hazardous Materials Response
- Aircraft Rescue
- Training & Duties Related To Emergency Response

Proposal Summary - Costs

- 0.04% impact on contribution rates
  - 0.02% Member
  - 0.01% Employer
  - 0.01% State

Presumptive Medical

Questions?

LAW ENFORCEMENT OFFICERS' AND FIRE FIGHTERS' PLAN 2 RETIREMENT BOARD

Presumptive Medical
Final Proposal

December 15, 2010

1. Issue

Law enforcement officers in LEOFF Plan 2 do not have any occupational illness & injury presumptions.

2. Proposal Summary

This proposal creates a presumption for law enforcement officers die as the direct and proximate result of a heart attack or stroke which occurred within 24 hours of nonroutine stressful or strenuous physical law enforcement activities.

This proposal also adds a presumption for fire fighters who experience strokes within seventy-two hours of exposure to smoke, fumes, or toxic substances; or within twenty-four hours of strenuous physical exertion due to firefighting activities.

The heat and stroke presumption in this proposal is modeled after the federal Public Safety Officers' Benefit (PSOB) presumption established in 2003 by the Home Town Heroes Act.

The proposal is expect to have a 0.04% impact on contribution rates (0.02% member, 0.01% employer, 0.01% State).

The proposal is retroactive to January 1, 2010.

3. Staff

Tim Valencia, MBA, GBA, RPA
Senior Research and Policy Manager
(360) 586-2326
tim.valencia@leoff.wa.gov

4. Members Impacted

This issue could impact any currently active, as well as any future, law enforcement officers in LEOFF Plan 2. As of June 30, 2009 there were 9,576 active law enforcement officers in LEOFF Plan 2 (Matthew M. Smith, 2010). Law enforcement officers account for approximately 56 percent of the active membership in the plan.

5. Current Situation

Law enforcement officers are not protected by a presumption for occupational illness/injury in Washington State. While the occupational illness/ injury provisions in the Workers' Compensation statutes do apply to law enforcement officers, the burden of proof to qualify for these benefits falls

on the member. An occupational illness/injury presumption does exist for fire fighters in Washington State.

Federal law contains a presumption for heart attack and stroke under the Public Safety Officers' Benefit (PSOB) program which applies to law enforcement officers in Washington State.

Many other states have occupational illness/injury presumption laws for law enforcement officers covering a wide range of conditions including cardiovascular problems, cancer, and infectious diseases.

6. Background Information and Policy Issues

A presumptive occupational illness/ injury law is a law that links a particular occupation with an illness/injury that has been shown to be a hazard associated with that occupation. As a result of this linkage, if an individual employed in the occupation covered by the presumption contracts an illness/ injury that are specified in the presumptive law, then that illness or injury is presumed to have originated from that occupation. In this case, the burden of proof shifts from the employee to the employer to demonstrate that the condition was not in fact associated with the occupation but with another cause.

Many states have an occupational illness/ injury presumption law that applies to at least one category of emergency response personnel. However, these presumption laws vary between states in terms of illness/injury covered and emergency response personnel covered. In the case of fire fighters, scientific evidence has demonstrated an increased risk for heart disease, lung disease, cancer, and infectious diseases. The research and evidence for law enforcement is not as strong. Despite the lack of study, several states and the Federal government have passed presumption laws for law enforcement officers.

Presumptive Coverage Provisions in Washington State

An occupational illness/injury presumption currently exists only for fire fighters in Washington State. The presumption of occupational illness/injury may be rebutted by a preponderance of evidence. First created in 1987, the presumption law only included respiratory illness as an occupational illness. The definition of occupational illness was expanded to include heart problems that are experienced within 72 hours of exposure to smoke, fumes, or toxic substances; certain cancers; and infectious diseases in 2002. The definition was further expanded in 2007 adding *heart problems that are experienced within 24 hours of strenuous physical exertion due to firefighting activities*. Certain cancers were also added to the list of cancers presumed to be occupational illnesses. (See Appendix: WA Fire Fighter Occupational Illness/Injury Presumption).

An occupational illness/injury presumption does not currently exist for law enforcement officers in Washington State. The LEOFF Plan 2 Retirement Board studied this issue in both the 2007 and 2008 interim periods, but did not make any recommendations to the Legislature.

Presumptive Coverage Provisions in Other States

A review of the workers' compensation, pension, and employment statutes of all 50 states shows that most of the states have an explicit occupational illness/injury presumption in statute. The presumptions vary from state to state in terms of which occupational illness/injury and which occupations (fire fighter, law enforcement, corrections, and municipal workers) are covered.

At least 32 states (64 percent) have an explicit occupational illness/injury presumption for law enforcement which covers one form of disease or injury while 22 states (44 percent) have a

presumption for heart problems. Table 1 (page 3) identifies the occupational illness/injury presumption coverage for law enforcement officers in each state.

Table 1: Presumption Coverage for Law Enforcement Officers

	State	Law Enforcement Presumption	Heart	Respiratory/Lung	Hypertension	Cancer	Stroke	Hepatitis	Tuberculosis	Other or Generally Defined Disease	HIV/AIDS	Meningococcal Meningitis
1	Alabama	No										
2	Alaska	No										
3	Arizona	Yes		✓		✓						
4	Arkansas	No										
5	California	Yes	✓			✓		✓	✓	✓		
6	Colorado	Yes						✓				
7	**Connecticut**	**Yes**	✓		✓							
8	**Delaware**	**Yes**								✓		
9	Florida	Yes	✓		✓				✓			
10	Georgia	No										
11	Hawaii	Yes	✓	✓								
12	Idaho	No										
13	Illinois	Yes	✓	✓		✓	✓		✓			
14	Indiana	Yes	✓	✓		✓		✓	✓	✓	✓	✓
15	Iowa	Yes	✓	✓								
16	Kansas	Yes	✓	✓		✓						
17	Kentucky	No										
18	Louisiana	Yes						✓				
19	Maine	Yes						✓	✓			✓
20	Maryland	Yes	✓		✓					✓		
21	Massachusetts	Yes	✓		✓							
22	Michigan	Yes	✓	✓						✓		
23	Minnesota	Yes	✓							✓		
24	Mississippi	No										
25	Missouri	No										
26	Montana	No										
27	**Nebraska**	**Yes**	✓	✓	✓							
28	Nevada	Yes	✓	✓								
29	New Hampshire	No										
30	New Jersey	Yes	✓				✓					
31	New Mexico	No										
32	New York	Yes						✓	✓		✓	
33	North Carolina	No										
34	North Dakota	Yes	✓	✓	✓			✓			✓	

	State	Law Enforcement Presumption	Heart	Respiratory/Lung	Hypertension	Cancer	Stroke	Hepatitis	Tuberculosis	Other or Generally Defined Disease	HIV/AIDS	Meningococcal Meningitis
35	Ohio	Yes	✓	✓								
36	Oklahoma	Yes								✓		
37	Oregon	No										
38	Pennsylvania	Yes	✓				✓	✓				
39	Rhode Island	Yes						✓			✓	
40	South Carolina	Yes	✓									
41	South Dakota	No										
42	Tennessee	Yes	✓		✓							
43	Texas	No										
44	Utah	Yes						✓		✓	✓	
45	Vermont	Yes	✓									
46	Virginia	Yes	✓		✓			✓	✓		✓	✓
47	Washington	No										
48	West Virginia	No										
49	**Wisconsin**	**Yes**						✓		✓	✓	✓
50	Wyoming	No										
	Total by Type	**32**	**22**	**11**	**8**	**5**	**3**	**12**	**7**	**9**	**7**	**4**

Presumptive Coverage Provisions at Federal Level

The Public Safety Officers' Benefits (PSOB) Act was enacted in 1976 to assist in the recruitment and retention of law enforcement officers and fire fighters. State and local law enforcement officers and fire fighters are covered for line-of-duty deaths occurring on or after September 29, 1976. As defined by Congress in Public Law 90-351 (Sec. 1217), a public safety officer includes individuals serving a public agency in an official capacity, with or without compensation, as a law enforcement officer or fire fighter.

The PSOB program provides death benefits in the form of a one-time financial payment to the eligible survivors of public safety officers whose deaths are the direct and proximate result of a traumatic injury sustained in the line-of-duty. Beneficiaries of the PSOB Death Benefits Program must comply with the PSOB Office's administrative review process by producing sufficient evidence to show that the public safety officer's death is the direct and proximate result of a personal injury sustained in the line-of-duty. The PSOB Act only covers death resulting from traumatic injuries sustained in the line-of-duty and does not have extensive coverage for occupational illness/injury. However, death resulting from heart attacks is covered in some instances.

The Hometown Heroes Survivors Benefits Act of 2003 (HHA), which amended the PSOB Act, was signed into law on December 15, 2003. The HHA includes a statutory presumption which

expanded the line-of-duty-related death[1] to include public safety officers who suffered a fatal heart attack or stroke following a "non-routine stressful or strenuous" physical public safety activity[2] or training exercise.

However, under the Act the statutory presumption that heart attacks or strokes following stressful or strenuous physical activity are line-of-duty-related deaths can be overcome with "competent medical evidence to the contrary." This means that an officer's pre-existing medical conditions that contribute to the heart attack or stroke may render the claim for benefits not compensable. Any claim for non-routine stressful or strenuous physical activities will also be excluded if such actions are of a clerical, administrative, or non-manual nature.

Further, the law requires that the officer died as a result of a heart attack or stroke suffered:

- while engaging or participating in such activity as described above;
- while still on that duty after so engaging or participating in such activity; or
- not later than 24 hours after so engaging or participating in such activity.

The HHA provision only covers deaths occurring on or after December 15, 2003. The HHA was not retroactive, and therefore does not apply to deaths occurring before the aforementioned date. See Appendix B: PSOB Statutes – Presumption for Heart Attack and Stroke.

Prior to the Hometown Heroes Survivor Benefits Act, in almost every incidence of death by heart attack or stroke it had been ruled that the heart attack or stroke was not a direct result of an injury sustained in the line-of-duty and the families received no benefits even though the deaths were clearly triggered by the rigors of the job.

The Hometown Heroes Survivor Benefit Act was intended to correct that deficiency in the law, by ensuring that public safety officers who suffered fatal heart attacks or strokes while on duty or not later than 24 hours after participating in a physical training exercise or responding to an emergency situation, are presumed to have died in the line-of-duty for purposes of public safety officers survivor benefits.

Despite the intent, it took a long time – from December 2003 to September 2006 – to update the PSOB program regulations to implement the Hometown Heroes Act. During this time, almost all applications for benefits were severely delayed or more likely denied. Several factors affected to the update of the program regulations, including the time it took to consult with public safety organizations and medical experts; and the time required for Department of Justice and Office of Management and Budget to review the proposed regulations.

Although the final PSOB Program regulations became effective on September 11, 2006, processing of claims was slow even after the regulations were in place. In October 2007, the Bureau of Justice

---

[1] The PSOB Program defines "line-of-duty" activity as an "activity or an action that [the public safety officer] is obligated or authorized by statute, rule, regulation, condition of employment or service, official mutual-aid agreement, or other law, to perform . . . under the auspices of the public agency he [she] serves, and such agency (or the relevant government) legally recognizes that activity or action to be so obligated or authorized . . . . [The activity] is performed (as applicable) in the course of law enforcement, providing fire protection, engaging in rescue activity, providing emergency medical services, or training for one of the foregoing, and such agency (or t the relevant government) legally recognizes it as such." See 28 C.F.R. § 32.3 (2006).

[2] To be considered "stressful" the physical activity must pose or appear to pose "significant threats or hazards" or involve "reasonably foreseeable risks of such threats or hazards" and provoke or cause "an unusually-high level of alarm, fear, or anxiety." To be considered "strenuous," the activity must "entail a high level of physical exertion." See 42 U.S.C. § 3796 (2006).

Assistance issued a policy memorandum that stated that "[r]esponding to an emergency call shall presumptively be treated as non-routine" for purposes of analyzing claims eligibility. The memorandum also stated that claims were to be reviewed based more on how stressful or strenuous an activity was and less on the frequency with which it was performed. Further, the revised policy stated that no activity was to be considered routine based solely on the public safety agency's description of the activity as being "routine" or "ordinary." (Office of the Inspector General, Evaluation and Inspection Division, 2008)

Law Enforcement Presumption Research

Senate Resolution and Report. During the 1991 Washington State Legislative Session, Senate Floor Resolution 8674 requested the Department of Labor and Industries to conduct a study of the unique occupational illness/injury hazards encountered by law enforcement officers and fire fighters. The Department of Labor and Industries was specifically asked to address the incidence of cancer and heart disease and the problems of proof associated with occupation illnesses/injuries. The study, conducted with the assistance of the Department of Health and the University of Washington, was completed December 1, 1992. An advisory committee was also established with representatives from stakeholder organizations.

With respect to law enforcement officers and cancer, the study reported that based on the available epidemiologic evidence that the overall risk of cancer among law enforcement officers was similar to that of the general population. The study also reported that there had been very few studies specifically designed to examine the risk of cancer among law enforcement officers.

The study reported with respect to law enforcement officers and circulatory disease that while the stresses associated with law enforcement officers are thought to increase the risk of ischemic heart disease, most epidemiologic studies found law enforcement officers to have a risk of death due to circulatory disease similar to, or only slightly above, that of the general population. Despite the available evidence suggesting increased risk of heart disease, there was not enough evidence from which to draw firm conclusions. The study reported that very few studies of this specific nature about law enforcement officers had been performed and current studies were limited to available death records which lack many specific details.

Infectious diseases for law enforcement officers, which were not included in the 1992 study, have been more readily covered in recent research. However, findings still only suggest that law enforcement officers have significantly elevated statistical rates for a number of diseases: despite these statistical findings, they do not necessarily prove causal association. Similarly, the more recent research on cancer and heart disease in law enforcement officers that has been published contains findings and conclusions similar to those presented in the 1992 Washington presumption report.

New Medical Research. Recently, the University of Buffalo completed a long-term study, called the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) study, which followed more than 400 police officers. Results showed that the officers over the age of 40 have a higher ten-year risk of a coronary event than the national average. It went on to illustrate 72 percent of female officers and 43 percent of male officers have higher than recommended cholesterol levels, and the police officers as a group have higher than average pulse rates and diastolic blood pressure. The author concluded that the pressures of law enforcement put officers' physical and mental health at risk and that they face increased risk of serious health problems such as diabetes and cardiovascular disease. However, the report fell short of drawing any causal conclusions regarding specific occupational illness/injury occurrences in law enforcement officers.

Appendix C contains a sample of citations and abstracts from literature about occupational illnesses/injuries for law enforcement officers.

7. Policy Options

Option 1: Create a presumption for heart problems for law enforcement officers.

This option would create a presumption for heart problems similar to the presumption established for fire fighters during the 2007 Legislative Session. A presumption would exist if law enforcement officers covered by LEOFF Plan 2 experienced heart problems within 24 hours of strenuous physical exertion due to law enforcement activities.

This option would:

- Require "law enforcement activities" to be specifically defined. This could include criteria such as participating in a physical training exercise, responding to an emergency situation, or other assigned duties related to or requiring a law enforcement response.
- Put Washington on level with the Federal Government and 22 other states that have presumptions to establish that heart problems are work related for law enforcement officers under disability or workers' compensation laws.
- Not be mutually exclusive from the other options; rather it could be selected in addition to Option 2 and/or Option 3.

Option 2: Include law enforcement officers in the presumption for infectious diseases.

This option would include law enforcement officers in LEOFF Plan 2 under the same presumption for infectious disease that currently covers fire fighters including Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome, all Strains of Hepatitis, Meningococcal Meningitis, and Mycobacterium Tuberculosis.

This option would:

- Provide coverage for the exposure of law enforcement officers, because of their employment, to uncontrolled environments containing various hazardous such as infectious diseases.
- Put Washington on level with 19 states that have presumptions to establish that various infectious diseases are work related for law enforcement officers under disability or workers' compensation laws.
- Not be mutually exclusive from the other options; rather it could be selected in addition to Option 1 and/or Option 3.

Option 3: Create a presumption for cancer.

This option would create a presumption for cancer.

This option would:

- Require the identification of the specific types of cancers to be covered.
- Put Washington on level with five other states that have a cancer presumption for law enforcement officers.
- Not be mutually exclusive from the other options; rather it could be selected in addition to Option 1 and/or Option 2.

Option 4: Create a presumption similar to PSOB Federal Presumption.

This option would create a presumption for law enforcement officers die as the direct and proximate result of a heart attack or stroke which occurred within 24 hours of nonroutine stressful or strenuous physical law enforcement activities.

This option would also add a presumption for fire fighters who experience strokes within seventy-two hours of exposure to smoke, fumes, or toxic substances; or within twenty-four hours of strenuous physical exertion due to firefighting activities as currently defined in state statute.

This option would:

- Model the federal Public Safety Officers' Benefit (PSOB) presumption established in 2003 by the Home Town Heroes Act.
- Cover deaths retroactive to January 1, 2010.

8. Supporting Information

- **Bill Draft**
- **Appendix A: WA Fire Fighter Occupational Illness/Injury Presumption**
- **Appendix B: PSOB Statute – Presumption for Heart Attack and Stroke**
- **Appendix C: Sample of Literature Regarding Law Enforcement Occupational Illness/Injury**
- **Bibliography**

AN ACT Relating to presumptions of occupational disease for law enforcement officers and firefighters; amending RCW 51.32.185; adding a new section to chapter 51.32 RCW; and creating a new section.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF WASHINGTON:

NEW SECTION. **Sec. 1.** A new section is added to chapter 51.32 RCW to read as follows:

(1) For purposes of this section, "law enforcement officer" shall mean either a law enforcement officer as defined in RCW 41.26.030(18) or a member of the state patrol retirement system under chapter 43.43 RCW.

(2) If a law enforcement officer who is covered under Title 51 RCW, dies as the direct and proximate result of a heart attack or stroke, that law enforcement officer shall be presumed to have died as the direct and proximate result of a personal injury sustained in the course of employment, if:

(a) That law enforcement officer, while on duty:

(i) Engaged in a situation, and such engagement involved nonroutine stressful or strenuous physical law enforcement, fire suppression, rescue, hazardous material response, emergency medical services, prison security, disaster relief, or other emergency response activity;

(ii) Participated in a training exercise, and such participation involved nonroutine stressful or strenuous physical activity; or

(iii) Responded to, or was in the course of responding to, a fire, rescue, or police emergency; and

(b) That officer died as a result of a heart attack or stroke suffered:

(i) While engaging or participating or responding as described under (a) of this subsection;

(ii) While still on duty after so engaging or participating or responding; or

(iii) Not later than twenty-four hours after so engaging or participating or responding; and

(c) This presumption is not overcome by competent medical evidence to the contrary.

(3) Nonroutine stressful physical activity means line of duty activity that:

(a) Is not performed as a matter of routine. Routine means that the level of stress is routine and not simply that the activity itself is performed with some regularity;

(b) Entails nonnegligible physical exertion; and

(c) Occurs with respect to a situation in which a law enforcement officer is engaged, under circumstances that objectively and reasonably:

(i) Pose, or appear to pose, significant dangers, threats, or hazards, or reasonably foreseeable risks thereof, not faced by similarly situated members of the public in the ordinary course; and provoke, cause, or occasion an unusually high level of alarm, fear, or anxiety; or

(ii) With respect to a training exercise in which a law enforcement officer participates, under circumstances that objectively and reasonably simulate in realistic fashion situations that pose significant dangers, threats, or hazards; and provoke, cause, or occasion an unusually high level of alarm, fear, or anxiety.

(4)(a) Nonroutine strenuous physical activity means line of duty activity that:

(i) Is not performed as a matter of routine. Routine means that the level of physical exertion is routine and not simply that the activity itself is performed with some regularity; and

(ii) Entails an unusually high level of physical exertion.

(b) Nonroutine stressful or strenuous physical activity excludes actions of a clerical, administrative, or nonmanual nature.

Sec. 2. RCW 51.32.185 and 2007 c 490 s 2 are each amended to read as follows:

(1) In the case of firefighters as defined in RCW 41.26.030((~~(4)~~)) (16) (a), (b), and (c) who are covered under Title 51 RCW and firefighters, including supervisors, employed on a full-time, fully compensated basis as a firefighter of a private sector employer's fire department that includes over fifty such firefighters, there shall exist a prima facie presumption that: (a) Respiratory disease; (b) any heart problems or strokes, experienced within seventy-two hours of exposure to smoke, fumes, or toxic substances, or experienced within twenty-four hours of strenuous physical exertion due to firefighting activities; (c) cancer; and (d) infectious diseases are occupational diseases under RCW 51.08.140. This presumption of occupational disease may be rebutted by a preponderance of the evidence. Such evidence may include, but is not limited to, use of tobacco products, physical fitness and weight, lifestyle, hereditary factors, and exposure from other employment or nonemployment activities.

(2) The presumptions established in subsection (1) of this section shall be extended to an applicable member following termination of service for a period of three calendar months for each year of requisite service, but may not extend more than sixty months following the last date of employment.

(3) The presumption established in subsection (1)(c) of this section shall only apply to any active or former firefighter who has cancer that develops or manifests itself after the firefighter has served at least ten years and who was given a qualifying medical examination upon becoming a firefighter that showed no evidence of cancer. The presumption within subsection (1)(c) of this section shall only apply to prostate cancer diagnosed prior to the age of fifty, primary brain cancer, malignant melanoma, leukemia, non-Hodgkin's lymphoma, bladder cancer, ureter cancer, colorectal cancer, multiple myeloma, testicular cancer, and kidney cancer.

(4) The presumption established in subsection (1)(d) of this section shall be extended to any firefighter who has contracted any of the following infectious diseases: Human immunodeficiency virus/acquired immunodeficiency syndrome, all strains of hepatitis, meningococcal meningitis, or mycobacterium tuberculosis.

(5) Beginning July 1, 2003, this section does not apply to a firefighter who develops a heart or lung condition and who is a regular user of tobacco products or who has a history of tobacco use. The department, using existing medical research, shall define in rule the extent of tobacco use that shall exclude a firefighter from the provisions of this section.

(6) For purposes of this section, "firefighting activities" means fire suppression, fire prevention, emergency medical services, rescue operations, hazardous materials response, aircraft rescue, and training and other assigned duties related to emergency response.

(7)(a) When a determination involving the presumption established in this section is appealed to the board of industrial insurance appeals and the final decision allows the claim for

benefits, the board of industrial insurance appeals shall order that all reasonable costs of the appeal, including attorney fees and witness fees, be paid to the firefighter or his or her beneficiary by the opposing party.

(b) When a determination involving the presumption established in this section is appealed to any court and the final decision allows the claim for benefits, the court shall order that all reasonable costs of the appeal, including attorney fees and witness fees, be paid to the firefighter or his or her beneficiary by the opposing party.

(c) When reasonable costs of the appeal must be paid by the department under this section in a state fund case, the costs shall be paid from the accident fund and charged to the costs of the claim.

NEW SECTION. **Sec. 3.** This act applies retroactively to January 1, 2010.

Appendix A: WA Fire Fighter Occupational Illness/Injury Presumption

In **1987**, the Legislature passed Engrossed Substitute Senate Bill 5801, which created a presumption that certain illness/injury were occupationally related for industrial insurance purposes for *only fire fighters*. As originally passed, this bill only included respiratory disease as an occupational illness/injury.

In **2002**, the Legislature amended the definition of occupational illness/injury to include heart problems that are experienced within 72 hours of exposure to: smoke; fumes; toxic substances; certain cancers; and infectious diseases.

The presumption of *cancer* as an occupational illness/injury only applies to fire fighters, where the cancer develops or manifests itself after the fire fighter has served at least ten-years, and was given a qualifying medical examination upon becoming a fire fighter that showed no evidence of cancer. Time served as a volunteer fire fighter does not count towards the ten-years of service required for presumptive cancer coverage.

Under the 2002 legislation, the presumption of cancer only applied to the following specific types of cancer[3]:

- Primary Brain Cancer
- Malignant Melanoma
- Leukemia
- Non-Hodgkin's Lymphoma
- Bladder Cancer
- Ureter Cancer
- Kidney Cancer

The presumption of *infectious disease* as an occupational illness/injury only applies to fire fighters who contracted the following:

- Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
- All Strains of Hepatitis
- Meningococcal Meningitis
- Mycobacterium Tuberculosis

In **2007**, the Legislature further expanded the occupational illness/injury presumption for fire fighters. A presumption of occupational illness/injury was added *for heart problems that are experienced within 24 hours of strenuous physical exertion due to firefighting activities*.

[3] The 2002 bill originally listed a broader set of cancers within the presumption than was passed in the final version of the bill. The original bill included the following types of cancer: Breast Cancer, Reproductive System Cancer ,Central Nervous System Cancer, Skin Cancer, Lymphatic System Cancer, Digestive System Cancer, Hematological System Cancer, Urinary System Cancer, Skeletal System Cancer, Oral System Cancer.

"Firefighting activities" means fire suppression, fire prevention, emergency medical services, rescue operations, hazardous materials response, aircraft rescue, and training and other assigned duties related to emergency response.

Certain cancers were also added to the list of cancers presumed to be occupational illness/injury:

- Prostate Cancer (diagnosed prior to the age of 50);
- Colorectal cancer;
- Multiple Myeloma; and
- Testicular cancer.

The presumption of occupational illness/injury may be rebutted by a preponderance of evidence, including, but not limited to use of tobacco products, physical fitness and weight, lifestyle, hereditary factors, and exposure from other employment or non-employment activities.

Since July 1, 2003, the presumption of occupational illness/injury has not applied to fire fighters who develop heart and/or lung condition and who are regular users of tobacco products or has a history of tobacco use.

After terminating from service the presumptions are extended such that a member can qualify for benefits for a period of three calendar months for each year of service, out to a maximum of 60 months following the last date of employment. For example, a member who separates from service after a ten-year career will be covered under the presumption for 2 ½ years (30 months) after the date of separation from employment.

In 2007, the Legislature also included provisions for the recovery of litigation costs and fees. When a determination involving the presumption of occupational illness/injury for fire fighters is appealed to the Board of Industrial Insurance Appeals or to any court and the final decision allows the claim for benefits, the Board of Industrial Insurance Appeals or the court must order that all reasonable costs of the appeal be paid to the fire fighter or his or her survivor/beneficiary.

Appendix B: PSOB Code and Regulations – Presumption for Heart Attack and Stroke

Hometown Heroes Survivors Benefits Act of 2003
42 U.S.C. § 3796(k)

(k) For purposes of this section if, if a public safety officer dies as the direct and proximate result of a heart attack or stroke, that officer shall be presumed to have died as the direct and proximate result of a person injury sustained in the line of duty, if—

(1) that officer, while on duty—

(A) engaged in a situation , and such engagement involved nonroutine stressful or strenuous physical law enforcement, fire suppression, rescue, hazardous material response, emergency medical services, prison security, disaster relief, or other emergency response activity; or

(B) participated in a training exercise, and such participation involved nonroutine stressful or strenuous physical activity;

(2) that officer died as a result of a heart attack or stroke suffered—

(A) while engaging or participating as described under paragraph (1);

(B) while still on that duty after so engaging or participating; or

(C) not later than 24 hours after so engaging or participating; and

(3) such presumption is not overcome by competent medical evidence to the contrary.

(l) For purposes of subsection (k), 'nonroutine stressful or strenuous physical' excludes actions of a clerical, administrative, or nonmanual nature.".

Subpart B of 28 C.F.R. Part 32 §32.13 Definitions

Engagement in a situation – A public safety officer is engaged in a situation only when, within his line of duty—

(1) He is in the course of actually--

(i) Engaging in law enforcement;

(ii) Suppressing fire;

(iii) Responding to a hazardous materials emergency;

(iv) Performing disaster relief activity; or

(v) Providing emergency medical services; or

(vi) Performing disaster relief activity; or

(vii) Otherwise responding to a fire, rescue, or police emergency; and

(2) The public agency he service (or the relevant government) legally recognizes him to be in such course (or, at a minimum, does not deny (or has not denied) him so to be).

Nonroutine strenuous physical activity – Except as excluded by the Act at 42 U.S.C 3796(l), nonroutine strenuous physical activity means line of duty activity that—

(1) Is not performed as a matter of routine; and

(2) Entails an unusually-high level of physical exertion.

Nonroutine stressful or strenuous physical activity means nonroutine stressful physical activity or nonroutine strenuous physical activity.

Nonroutine stressful physical activity—Except as excluded by the Act, at 42 U.S.C. 3796(l), nonroutine stressful physical activity means line of duty activity that—

(1) Is not performed as a matter of routine;

(2) Entails non-negligible physical exertion; and

(3) Occurs—

(i) With respect to a situation in which a public safety officer is engaged, under circumstances that objectively and reasonably—

(A) Pose (or appear to pose) significant dangers, threats, or hazards (or reasonably-foreseeable risks thereof), not faced by similarly-situated members of the public in the ordinary course; and

(B) Provoke, cause, or occasion an unusually-high level of alarm, fear or anxiety; or

(ii) With respect to a training exercise in which a public safety officer participates, under circumstances that objectively and reasonably—

(A) Simulate in realistic fashion situations that pose significant dangers, threats, or hazards; and

(B) Provoke, cause, or occasion an unusually-high level of alarm, fear, or anxiety.

Appendix C: Sample of Literature Regarding Law Enforcement Occupational Illness/Injury

1. **Potential work-related exposures to blood borne pathogens by industry and occupation in the United States Part II: A telephone interview study.**
   Chen GX, Jenkins EL. American Journal of Industrial Medicine. 50(4):285-92. April 2007

   BACKGROUND: The companion surveillance portion of this study [Chen and Jenkins, 2007] reported the frequency and rate of potential work-related exposures to bloodborne pathogens (BBP) treated in emergency departments (EDs) by industry and occupation, but it lacks details on the circumstances of the exposure and other relevant issues such as BBP safety training, use of personal protective equipment (PPE) or safety needles, or reasons for seeking treatment in a hospital ED.

   METHODS: Telephone interviews were conducted with workers who had been treated in EDs for potential work-related exposures to BBP in 2000-2002. Respondents were drawn from the National Electronic Injury Surveillance System.

   RESULTS: Of the 593 interviews, 382 were from hospitals, 51 were from emergency medical service/firefighting (EMS/FF), 86 were from non-hospital healthcare settings (e.g., nursing homes, doctors' offices, home healthcare providers, etc.), 22 were from law enforcement (including police and correctional facilities), and 52 were from other non-healthcare settings (i.e., schools, hotels, and restaurants). Needlestick/sharps injuries were the primary source of exposure in hospitals and non-hospital healthcare settings. Skin and mucous membrane was the primary route of exposure in EMS/FF. Human bites accounted for a significant portion of the exposures in law enforcement and other non-healthcare settings. In general, workers from non-hospital settings were less likely to use PPE, to have BBP safety training, to be aware of the BBP standards and exposure treatment procedures, and to report or seek treatment for a work-related exposure compared to hospital workers.

   CONCLUSIONS: This study suggests that each industry group has unique needs that should be addressed.

2. **Cardiovascular disease risk factors and the perception of general health among male law enforcement officers: encouraging behavioral change.**
   Ramey SL. American Association of Occupational Health Nurses Journal. 51(5):219-26. May 2003.

   The relationship among cardiovascular disease (CVD) morbidity, risk factors (including stress), and the perception of health among male law enforcement officers (LEOs) compared to men in the general population were examined in this study. Self reported prevalence of CVD and CVD risk factors among currently employed male LEOs from nine states (n = 2,818) were compared to those of other men in the same states (n = 9,650 for CVD risk factors, n = 3,147 for CVD prevalence). Perceived stress in LEOs was assessed to determine if it affected the relationship between CVD prevalence and CVD risk factors. Cross tabulated

simple percentages showed CVD was less prevalent in the LEO group than among the general population. The best predictor variables for CVD were perceived stress, time in the profession, and hypertension. The LEO group had greater prevalence of hypercholesterolemia, overweight, and tobacco use than the general population. However, a greater percentage of LEOs perceived their health as "good to excellent" compared to men in the general population. Using multivariate analysis of variance (MANOVA) it was determined that perceived stress was associated with CVD in the LEO group and three CVD risk factors (i.e., cholesterol, hypertension, physical activity) were significantly affected by perceived stress. Among susceptible officers, stress may contribute to CVD development as well as potentiate several CVD risk factors. However, an apparent lack of association exists between perception of general health and CVD risk in LEOs.

3. **The risk of acquiring hepatitis B or C among public safety workers: a systematic review.**
Rischitelli G, Harris J, McCauley L, Gershon R, Guidotti T. American Journal of Preventative Medicine. 20(4):299-306; May 2001.

CONTEXT: Determination of the occupational risk of hepatitis B and C to public safety workers is important in identifying prevention opportunities and has significant legal and policy implications.

OBJECTIVES: Characterize the risk of occupationally acquired infection: (1) risk of exposure to blood and body fluids, (2) seroprevalence of hepatitis B and C in the source population, and (3) risk of infection after exposure.

DATA SOURCES: Electronic search of MEDLINE (1991-1999), HealthStar (1982-1999), and CINAHL (1975-1999) supplemented by selected reference citations and correspondence with authors of relevant articles.

STUDY SELECTION: Peer-reviewed journal articles (N=702) that addressed the transmission of hepatitis B and C in law enforcement, correctional, fire, emergency medical services, and healthcare personnel were identified. One hundred five (15.0%) articles were selected for full-text retrieval; 72 (68.6%) were selected for inclusion.

DATA ABSTRACTION: Articles selected for inclusion were abstracted by two reviewers and checked by a third reviewer, using a standard reporting form. Evidence tables were constructed, using the standardized abstracts. The tables were designed to summarize data for the key elements of the risk analysis.

CONCLUSIONS: Data suggest that emergency medical service (EMS) providers are at increased risk of contracting hepatitis B, but data have failed to show an increased prevalence of hepatitis C. EMS providers have exposure risks similar to those of hospital-based healthcare workers. Other public safety workers appear to have lower rates of exposure. Urban areas have much higher prevalence of disease, and public safety workers in those areas are likely to experience a higher incidence of exposure events.

4. **Occupational needlestick injuries in a metropolitan police force.**
Lorentz J, Hill L, Samimi B. American Journal of Preventative Medicine. 18(2):146-50; February 2000.

OBJECTIVES: Police officers are at risk of bloodborne diseases through needlestick injuries but few studies have addressed this problem. The purpose of this study was to assess the risk of needlestick injuries in law enforcement officers and to determine predictors of injuries and reporting rates.

DESIGN: An anonymous, voluntary questionnaire was distributed to 1738 active-duty, metropolitan police officers. The survey included the number of needlestick injuries ever experienced, how often these were reported, activities at the time of injury and attitudes toward injuries.

RESULTS: Of the 803 respondents (46.2% of survey population), 29.7% had at least one needlestick injury, and 27.7% of this group had two or more. Risk factors included evening shifts, pat-down searches, patrol duties, male gender and less experience. Only 39.2% sought medical attention for these injuries.

CONCLUSIONS: Needlestick injuries occur with considerable frequency in this group of law enforcement personnel, suggesting an increased risk of becoming infected with bloodborne pathogens, including hepatitis B, hepatitis C and HIV.

5. **Coronary heart disease risk factors in employees of Iowa's Department of Public Safety compared to a cohort of the general population.**
Franke WD, Cox DF, Schultz DP, Anderson DF. American Journal of Industrial Medicine. 31(6):733-7; June 1997.

The prevalence of coronary heart disease (CHD) risk factors in law enforcement personnel compared to that in the general population was studied by determining the predicted 10-year risk for developing CHD (CHD10, expressed as %) in subjects from the Iowa Department of Public Safety and comparing it to the average CHD10 for similarly aged subjects in the Framingham Heart Study cohort. The Iowa data included measures on 388 men from 30 to 64 years old, 246 of whom were measured in 1980-1981 and again in 1992-1993. The CHD10 came from an algorithm developed using the Framingham data; it included measures of age, gender, cholesterol, HDL-C, systolic blood pressure, smoking habit, glucose level, and left ventricular hypertrophy (ECG criteria). For this group, average CHD10 was reported by age in five-year increments [Circulation 83:356, 1991]. The Iowa subjects (n = 388) did not show a statistically significant difference in CHD10 from the reference population (8.9% versus 7.9%). The change with age was very similar in the two groups: for Iowa (n = 388) the estimate was CHD10 = -16.5 + .59 (age); for Framingham it was CHD10 = -17.5 + .60 (age). The change in individual risk factors with time was also similar in both groups; the per year change in CHD10 in the Iowa subjects, which was measured twice (n = 246, 0.63%), did not differ statistically from the 0.60% change predicted by the Framingham model. These results

suggest that, for the risk factors considered here, the 10-year probability of developing CHD among Iowa law enforcement personnel is similar to that found in the Framingham population.

6. **Epidemiological studies of work-related injuries among law enforcement personnel.**
   Sullivan CS, Shimizu KT. J Soc Occup Med. 1988 Spring-Summer;38(1-2):33-40.

7. **Career risk of hepatitis C virus infection among U.S. emergency medical and public safety workers.**
   Rischitelli G, Lasarev M, McCauley L.Journal of Occupational & Environmental Medicine. 2005 47(11):1174-1181. Erratum in: J Occup Environ Med. 2006 Mar;48(3):234-5.

   OBJECTIVE: A probabilistic model was used to analyze the cumulative risk of occupational hepatitis C virus (HCV) infection among U.S. public safety workers.
   METHODS: A model for the career risk of HCV was developed using the frequency of parenteral exposures to blood, the population seroprevalence of HCV, and the risk of seroconversion after exposure. Estimates of key input variables were obtained from published studies.

   RESULTS: Calculated estimates of the 30-year risk of infection ranged from <0.1% for police, firefighters, and corrections officers to 1.9% among paramedics and emergency department personnel in high-risk communities. Infrequent exposure to high-risk blood seems to present a greater risk of infection than more frequent contact to low-risk populations.

   CONCLUSIONS: Use of a probabilistic risk assessment model using published data can assist in policy decisions designed to protect the health and safety of workers. Further efforts to document the frequency of occupationally acquired HCV are needed.

8. **Cost-effectiveness of hepatitis A-B vaccine versus hepatitis B vaccine for healthcare and public safety workers in the western United States.**
   Jacobs RJ, Gibson GA, Meyerhoff AS. Infection Control and Hospital Epidemiology. 2004 Jul;25(7):563-9.

   OBJECTIVE: To determine the cost-effectiveness of substituting hepatitis A-B vaccine for hepatitis B vaccine when healthcare and public safety workers in the western United States are immunized to protect against occupational exposures to hepatitis B.

   PARTICIPANTS: A cohort of 100,000 hypothetical healthcare and public safety workers from 11 western states with hepatitis A rates twice the national average.
   DESIGN: A Markov model of hepatitis A was developed using estimates from U.S. government databases, published literature, and an expert panel. Added costs of hepatitis A-B vaccine were compared with savings from reduced hepatitis A treatment and work loss. Cost-effectiveness was expressed as the ratio of net costs to quality-adjusted life-years (QALYs) gained.

RESULTS: Substituting hepatitis A-B vaccine would prevent 29,796 work-loss-days, 222 hospitalizations, 6 premature deaths, and the loss of 214 QALYs. Added vaccination costs of $5.4 million would be more than offset by $1.9 million and $6.1 million reductions in hepatitis A treatment and work loss costs, respectively. Cost-effectiveness improves as the time horizon is extended, from $232,600 per QALY after 1 year to less than $0 per QALY within 11 years. Estimates are most sensitive to community-wide hepatitis A rates and the degree to which childhood vaccination may reduce future rates.

CONCLUSION: For healthcare and public safety workers in western states, substituting hepatitis A-B vaccine for hepatitis B vaccine would reduce morbidity, mortality, and costs.

9. **Occupational exposures and risk of hepatitis B virus infection among public safety workers.**
Averhoff FM, Moyer LA, Woodruff BA, Deladisma AM, Nunnery J, Alter MJ, Margolis HS. Journal of Occupational & Environmental Medicine. June 2002; 44(6):591-6.

We conducted a questionnaire and seroprevalence survey to determine the frequency and type of occupational exposures (OEs) and the risk of hepatitis B virus (HBV) infection experienced by public safety workers (PSWs). Of the 2910 PSWs who completed the survey, 6.8% reported at least one OE in the previous 6 months, including needlestick (1.0%), being cut with a contaminated object (2.8%), mucous membrance exposure to blood (0.9%), and being bitten by a human (3.5%). The rate of OE varied by occupation with 2.7% of firefighters, 3.2% of sheriff officers, 6.6% of corrections officers, and 7.4% of police officers reporting > or = 1 OE ($P < 0.001$). The HBV infection prevalence was 8.6%, and after adjustment for age and race, it was comparable to the overall US prevalence and did not vary by occupation. By multivariate analysis, HBV infection was not associated with any OEs, but it was associated with older age, being nonwhite, and a previous history of a sexually transmitted disease. This study demonstrated that although OEs are not uncommon among PSWs, HBV infection was more likely to be associated with nonoccupational risk factors. Administration of hepatitis B vaccine to PSWs early in their careers will prevent HBV infection associated with occupational and non-OEs.

10. **Hepatitis C in urban and rural public safety workers.**
Rischitelli G, McCauley L, Lambert WE, Lasarev M, Mahoney E. Journal of Occupational & Environmental Medicine. 2002 Jun;44(6):568 -73.

A sample of 719 Oregon public safety personnel (police officers, firefighters, and corrections officers) was tested for hepatitis C virus (HCV) antibody after completing a risk questionnaire. Seven of nine positive enzyme immunoassay tests (78%) were confirmed with recombinant immunoblot assay, yielding confirmed prevalence estimates of 1.2% (95% confidence interval, 0.4 to 2.8%) among the 406 firefighters and emergency medical technicians, and 0.7% (95% confidence interval, 0.1 to 2.6%) in 274 corrections personnel. No cases were observed in the 29 participating police officers. Self-reports of the number of workplace exposures to blood were not associated with HCV positivity, and the number of

years of public safety employment seemed to be slightly less for HCV-positive subjects. Two of the seven (28.6%) HCV-positive individuals reported having at least one nonoccupational risk factor (odds ratio, 4.3; 95% confidence interval, 0.4 to 27.1), suggesting the greater relative importance of nonoccupational exposures.

11. Hepatitis C screening and prevalence among urban public safety workers.
Upfal MJ, Naylor P, Mutchnick MM. Journal of Occupational & Environmental Medicine. 2001 Apr;43(4):402-11.

This study examines the prevalence of anti-hepatitis C virus by using an enzyme-linked immunoassay test (EIA-2) in 2447 volunteers (including 1560 police, 678 fire, and 209 emergency medical service personnel) and a self-reported questionnaire on potential occupational and non-occupational risk factors. Subjects consisted of 76% men, 54.8% blacks, and 40.3% whites. Twenty-eight individuals (1.1%) tested positive, with prevalence rates of 1.1% and 1.3%, respectively, among blacks and whites. Although firefighters and emergency medical service workers had a higher prevalence (2.3% and 2.8%) than police (0.6%), the overall prevalence was lower than that typical of urban populations. In a multivariate analysis, the most important risk factors were behavioral, with no significant occupational exposure risk observed. Previously reported racial differences were not detected in this study, most likely because the subjects were of similar socioeconomic status.

12. Potential work-related exposures to bloodborne pathogens by industry and occupation in the United States Part II: A telephone interview study.
Chen GX, Jenkins EL. American Journal of Industrial Medicine. 2007 Apr;50(4):285-92.

BACKGROUND: The companion surveillance portion of this study [Chen and Jenkins, 2007] reported the frequency and rate of potential work-related exposures to bloodborne pathogens (BBP) treated in emergency departments (EDs) by industry and occupation, but it lacks details on the circumstances of the exposure and other relevant issues such as BBP safety training, use of personal protective equipment (PPE) or safety needles, or reasons for seeking treatment in a hospital ED.

METHODS: Telephone interviews were conducted with workers who had been treated in EDs for potential work-related exposures to BBP in 2000-2002. Respondents were drawn from the National Electronic Injury Surveillance System.

RESULTS: Of the 593 interviews, 382 were from hospitals, 51 were from emergency medical service/firefighting (EMS/FF), 86 were from non-hospital healthcare settings (e.g., nursing homes, doctors' offices, home healthcare providers, etc.), 22 were from law enforcement (including police and correctional facilities), and 52 were from other non-healthcare settings (i.e., schools, hotels, and restaurants). Needlestick/sharps injuries were the primary source of exposure in hospitals and non-hospital healthcare settings. Skin and mucous membrane was the primary route of exposure in EMS/FF. Human bites accounted for a significant portion of the exposures in law enforcement and other non-healthcare settings. In general, workers from non-hospital settings were less likely to use PPE, to have

BBP safety training, to be aware of the BBP standards and exposure treatment procedures, and to report or seek treatment for a work-related exposure compared to hospital workers.

CONCLUSIONS: This study suggests that each industry group has unique needs that should be addressed.

13. Relationship Between Cardiovascular Disease Morbidity, Risk Factors, and Stress in a Law Enforcement Cohort.
Franke, Warren D. PhD; Ramey, Sandra L. PHD; Shelley, MackC. II, PhD. Journal of Occupational & Environmental Medicine. 44(12); 1182-1189, December 2002.

It is unclear to what extent law enforcement officers (LEOs) experience increased prevalence of cardiovascular disease (CVD; defined as coronary heart disease, myocardial infarction, angina, or stroke) and, if so, whether perceived stress affects this relationship. First, self-reported CVD risk factors among currently employed male LEOs from 9 states (n = 2818) were compared to CVD risk factors among similarly-aged males with similar incomes in the same states (n = 8046). Second, CVD prevalence was compared among LEOs (n = 1791) and similarly-aged males with similar incomes (n = 2575) from four of these states. Finally, among the LEOs only, the possible effect of perceived stress on the relationship between CVD prevalence and CVD risk factors was assessed. LEOs reported higher prevalence of hypertension, hypercholesterolemia, tobacco use, and elevated body mass index. CVD prevalence did not differ significantly between the LEO group and the general population (2.3% +/- 15% versus 3.1% +/- 17%;P = 0.095). In the LEO-only group, the best predictors of CVD were: time in the profession (OR = 1.07; 95% CI = 1.03-1.11), perceived stress (OR = 1.05; 95% CI = 1.00-1.10), and hypertension (OR = 0.33; 95% CI = 0.18-0.62). In the LEO-only group, perceived stress was associated with CVD (P = 0.008), and three CVD risk factors were significantly affected by perceived stress: cholesterol, hypertension, and physical activity. Perceived stress was affected by duration of time in the profession (P = 0.004), independent of an age effect (P = 0.353). Among susceptible officers, perceived stress may contribute to CVD directly and through potentiating several CVD risk factors.

14. Cardiovascular Disease Morbidity in an Iowa Law Enforcement Cohor, Compared with the General Iowa Population.
Franke, Warren D. PhD; Collins, Shannon A. MS; Hinz, Paul N. PhD. Journal of Occupational & Environmental Medicine. 40(5); 441-444, May 1998.

It remains uncertain if law enforcement officers experience an elevated cardiovascular disease morbidity and, if so, whether their profession contributes to this incidence. Consequently, the self-reported incidence of cardiovascular disease (CVD) (coronary heart disease, myocardial infarction, stroke, coronary artery bypass graft surgery, angioplasty) and CVD risk factors (age, diabetes, elevated body mass index (>= 27.8 kg [middle dot] m-2), hypercholesterolemia, hypertension, tobacco use) in 232 male retirees, >= 55 years of age, from the Iowa Department of Public Safety were compared with 817 male Iowans of similar age. CVD incidence was higher in the law enforcement officers than the general population (31.5% vs 18.4%, P < 0.001). Using multiple logistic regression, factors found to be

associated with CVD included the law enforcement profession (odds ratio [OR]= 2.34; 95% confidence interval [95% CI] = 1.5-3.6), hypercholesterolemia (OR= 2.37; 95% CI = 1.7-3.3); diabetes (OR = 2.22; 95% CI = 1.4-3.6), hypertension (OR = 1.79; 95% CI = 1.3-2.5), tobacco use (OR = 1.67; 95% CI = 1.07-2.6), and age (OR = 1.06; 95% CI = 1.03-1.08). These results suggest that employment as a law enforcement officer is associated with an increased cardiovascular disease morbidity and this relationship persists after considering several conventional risk factors.

15. Ischemic Heart Disease Mortality and Occupation Among 16- to 60-Year-Old Males.
Calvert, Geoffrey M. MD, MPH; Merling, Jeffrey W. MD; Burnett, Carol A. MS.Journal of Occupational & Environmental Medicine. 41(11):960-966, November 1999.

Cardiovascular disease is the leading cause of death, and the role of occupation continues to generate interest. Using the National Occupational Mortality Surveillance system, proportionate mortality ratio (PMR) analyses were used to examine the association between occupation and ischemic heart disease among 16- to 60-year-old males. We used data from 1982-1992 from 27 states. Separate analyses were conducted for blue-collar and white-collar occupations. Among the blue-collar occupations with the highest PMRs for ischemic heart disease mortality were sheriffs, correctional institution officers, policemen, firefighters, and machine operators. Physicians (blacks only) and clergy (both races) were among the white-collar occupations with the highest PMRs for ischemic heart disease. Although more study is needed, consideration should be made for targeting high-PMR occupations, with improvement in work organization to reduce occupational stress and promotion of healthy lifestyles through cardiovascular disease prevention programs.

16. Occupational Exposures and Risk of Hepatitis B Virus Infection Among Public Safety Workers.
Averhoff, Francisco M. MD, MPH; Moyer, Linda A. RN; Woodruff, Bradley A. MD, MPH; Deladisma, Adeline M. MPH; Nunnery, Joni MPH; Alter, Miriam J. PhD; Margolis, Harold S. MD.Journal of Occupational & Environmental Medicine. 44(6):591-596, June 2002.

We conducted a questionnaire and seroprevalence survey to determine the frequency and type of occupational exposures (OEs) and the risk of hepatitis B virus (HBV) infection experienced by public safety workers (PSWs). Of the 2910 PSWs who completed the survey, 6.8% reported at least one OE in the previous 6 months, including needlestick (1.0%), being cut with a contaminated object (2.8%), mucous membrane exposure to blood (0.9%), and being bitten by a human (3.5%). The rate of OE varied by occupation with 2.7% of firefighters, 3.2% of sheriff officers, 6.6% of corrections officers, and 7.4% of police officers reporting >=1 OE ($P < 0.001$). The HBV infection prevalence was 8.6%, and after adjustment for age and race, it was comparable to the overall US prevalence and did not vary by occupation. This study demonstrated that although OEs are not uncommon among PSWs, HBV infection was more likely to be associated with nonoccupational risk factors. Administration of hepatitis B vaccine to PSWs early in their careers will prevent HBV infection associated with occupational and non-OEs.

17. Cancer incidence among Ontario police officers

Murray M. Finkelstein, PhD, MDCM; American Journal of Industrial Medicine Volume 34, Issue 2 , Pages 157 – 162; Published Online: 6 Dec 1998

The National Institute for Occupational Safety and Health (NIOSH) published a report in 1995 suggesting the possibility of increased incidence of testicular cancer, leukemia, and cancers of the brain, eye, and skin among police officers working with traffic radar. NIOSH recommended epidemiologic study of the issue. This report presents the results of a retrospective cohort cancer incidence study among 22,197 officers employed by 83 Ontario police departments. The standardized incidence ratio (SIR) for all tumor sites was 0.90 (95% confidence interval [CI] = 0.83-0.98). There was an increased incidence of testicular cancer (SIR = 1.3, 90%CI = 0.9-1.8) and melanoma skin cancer (SIR = 1.45, 90%CI = 1.1-1.9). These anatomical sites might absorb energy from radar units, but at this time the author has no information about individual exposures to radar emissions, and it is not possible to draw etiologic conclusions.

18. Dying from the Job: The Mortality Risk for Police Officers

John M. Violanti, Phd., Law Enforcement Wellness Association
http://cophealth.com/articles/articles_dying_a.html, viewed 3/3/08.

There are an estimated 623,000 sworn police officers employed in the United States, yet few studies of long term health risks have been conducted. It has been argued that police officers are at increased risk for mortality as a result of their occupation. The average age of death for police officer in our 40-year study was 66 years of age.

Although it is not possible to change the dangers inherent in police work, it is possible to change aspects which affect the long term health of officers. The present findings suggest that police officers are at significantly elevated risks for a number of diseases and appropriate interventions should be instituted. Elevated mortality risk of colon cancer and other digestive cancers , for example, indicates a need for earlier detection with stool tests or frequent medical examinations. Such medical examinations are lacking as part of work benefits in most police agencies. Elevated risk for cirrhosis, arteriosclerotic heart disease, and all malignant neoplasms combined are also diseases of concern. Prevention should emphasize management programs which include health education, physical exercise , smoking abatement, and dangers of alcohol use. The elevated risk of suicide among police officers in present study indicates the effect of a high stress work environment and perhaps the officer's inability to adequately cope with stress. In addition to stress management and suicide awareness education, police officers should have confidential psychological services available to help them deal with such difficulties. Only one of five police agencies presently have such programs. Shift work is another possible factor related to long term health problems. Departments should consider arranging work shifts to optimally benefit officers in terms of proper sleep. Shifts, for example, should not be changed for at least 4-6 weeks at a time, as rapid shift changes exacerbate strain on the body.

Lastly, there is need for police departments to consider alternatives to police organizational structure which can produce much of the stress experienced by police officers. Officers report that approximately 90% of stress in their work is a result of a highly structured, unresponsive, uncaring administration. Changes should include allowing officers the opportunity to participate in decisions affecting their work, and a greater organizational awareness of problems at the street level.

No simple answers exist for prevention of disease in police work. The present study may help to understand correlates of the long term health effects of this occupation and provide a basis for future work.

19. Work Stress in Aging Police Officers.
Journal of Occupational & Environmental Medicine. 44(2):160-167, February 2002.
Gershon, Robyn R. M. MHS, DrPH; Lin, Susan MPH; Li, Xianbin MHS, PhD

Data are sparse regarding the impact of psychosocial work stress on the health and well-being of aging workers, even for employees working in high-stress occupations, such as law enforcement. To improve our understanding of this issue in older workers, we assessed and characterized work stress, coping strategies, and stress-related health outcomes in a sample of police officers aged 50 years and older (n = 105). The most important risk factors associated with officers' perceived work stress were maladaptive coping behaviors (eg, excessive drinking or problem gambling) (odds ratio [OR], 4.95; 95% confidence interval [CI], 2.11 to 11.6) and exposure to critical incidents (eg, shootings) (OR, 3.84; 95% CI, 1.71 to 8.65). In turn, perceived work stress was significantly associated with anxiety (OR, 6.84; 95% CI, 2.81 to 16.65), depression (OR, 9.27; 95% CI, 3.81 to 22.54), somatization (OR, 5.74; 95% CI, 2.47 to 13.33), posttraumatic stress symptoms (OR, 2.89; 95% CI, 1.29 to 6.47), symptoms of "burnout" (OR, 5.93; 95% CI, 2.54 to 13.86), chronic back pain (OR, = 3.55; 95% CI, 1.57 to 8.06), alcohol abuse (OR, 3.24; 95% CI, 1.45 to 7.22), and inappropriately aggressive behavior (OR, 4.00; 95% CI, 1.34 to 11.88). These data suggest that older workers in high-stress jobs may be at increased risk for work stress-related health problems, especially if they rely on risky health behaviors to cope with stress. Given the size of the rapidly aging US workforce and the likelihood that many are employed in high-stress jobs, interventions are urgently needed to address this emerging public health issue.

20. A Prospective Study of Occupation and Prostate Cancer Risk.
Journal of Occupational & Environmental Medicine. 46(3):271-279, March 2004. Zeegers, Maurice P. A. PhD; Friesema, Ingrid H. M. MSc; Goldbohm, R. Alexandra PhD; van den Brandt, Piet A. PhD

A wide variety of occupations has been associated with prostate cancer in previous retrospective studies. Most attention has been paid to farming, metal working, and the rubber industry. Today, these results cannot be affirmed with confidence, because many associations could be influenced by recall bias, have been inconsistent, or have not been confirmed satisfactory in subsequent studies. This study was conducted to investigate and confirm these important associations in a large prospective cohort study. The authors conducted a

prospective cohort study among 58,279 men. In September 1986, the cohort members (55-69 years) completed a self-administered questionnaire on potential cancer risk factors, including job history. Related job codes were clustered in professional groups. These predefined clusters were investigated in 3 time windows: 1) profession ever performed, 2) longest profession ever held, and 3) last profession held at baseline. Follow up for incident prostate cancer was established by linkage to cancer registries until December 1993. A case-cohort approach was used based on 830 cases and 1525 subcohort members. To minimize false-positive results, 99% confidence intervals (99% CI) were calculated. Although moderately decreased prostate cancer risks were found for electricians, farmers, firefighters, woodworkers, textile workers, butchers, salesmen, teachers, and clerical workers, none of the relative risks (RR) were found to be statistically significant. For road transporters, metal workers, and managers, no association with prostate cancer risk was found. Although the RR for railway workers, mechanics, welders, chemists, painters, and cooks was moderately increased, these estimates were not statistically significant. For men who reported to have ever worked in the rubber industry, we found a substantially increased prostate cancer risk, but not statistically significant (RR, 4.18; 99% CI = 0.22-80.45). **For policemen, we found a substantial and marginally statistically significant increased prostate cancer risk, especially for those who reported working as a policeman for most of their occupational life (RR, 3.91; 99% CI = 1.14-13.42) or as the last profession held at baseline (RR, 4.00; 99% CI = 1.19-13.37).** Most of the previously investigated associations between occupation and prostate cancer risk could not be confirmed with confidence in this prospective study. The lack of statistical significance for rubber workers could be caused by the scarcity of rubber workers in this cohort and subsequent lack of power. The results for policemen were substantial and statistically significant, although a conservative value for significance level was used.

21. **Hyperinsulinemia and the Risk of Stroke in Healthy Middle-Aged Men: The 22-Year follow-Up Results of the Helsinki Policemen Study.**
Stroke. 29(9):1860-1866, September 1998. *Pyorala, Marja MD; Miettinen, Heikki MD; Laakso, Markku MD; Pyorala, Kalevi MD*

Background and Purpose: Several studies have shown that hyperinsulinemia is associated with the risk of coronary heart disease, but information on the association of hyperinsulinemia with the risk of stroke is limited. We investigated the association of hyperinsulinemia with the risk of stroke during a 22-year follow-up of the Helsinki Policemen Study population. Conclusions: Hyperinsulinemia was associated with the risk of stroke in Helsinki policemen during the 22-year follow-up, but not independently of other risk factors, particularly upper body obesity. (Stroke. 1998;29:1860-1866.)

Bibliography

Mattew M. Smith, S. A. (2010). *2009 Actuarial Valuation - LEOFF Plan 2.* Olympia: Office of the State Actuary (WA).

Office of the Inspector General, Evaluation and Inspection Division. (2008). *The Office of Justice Programs' Implementation of the Hometown Heroes Survivors Benefits Act of 2003.* Washington D.C.: US Dept of Justice.

DRAFT
ACTUARY'S FISCAL NOTE

RESPONDING AGENCY:	CODE:	DATE:	PROPOSAL [NAME or Z-NUMBER]:
Office of the State Actuary	**035**	**12/6/10**	**Presumptive Medical**

WHAT THE READER SHOULD KNOW

The Office of the State Actuary ("we") prepared this draft fiscal note based on our understanding of the proposal as of the date shown above. We intend this draft fiscal note to be used by the Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement Board during the 2010 Interim only. If a legislator introduces this proposal as a bill during the next Legislative Session, we will prepare a final fiscal note based on that bill language. The actuarial results shown in this draft fiscal note may change when we prepare our final version for the Legislature.

We advise readers of this draft fiscal note to seek professional guidance as to its content and interpretation, and not to rely upon this communication without such guidance. Please read the analysis shown in this draft fiscal note as a whole. Distribution of, or reliance on, only parts of this draft fiscal note could result in its misuse, and may mislead others.

SUMMARY OF RESULTS

The proposal adds heart attacks and strokes that result in death or permanent disability shortly after performing non-routine or strenuous work-related activities as presumptive duty-related conditions for all plan members.

Impact on Pension Liability			
(Dollars in Millions)	Current	Increase	Total
Today's Value of All Future Pensions	$11,895	$6.9	$11,902
Earned Pensions Not Covered by Today's Assets	($1,111)	$0.0	($1,111)

Impact on Contribution Rates: (Effective 09/01/2011)	
2011-2013 State Budget	LEOFF
Employee (Plan 2)	0.02%
Employer:	
Current Annual Cost	0.01%
Plan 1 Past Cost	0.00%
Total	0.01%
State	
Current Annual Cost	0.01%
Plan 1 Past Cost	0.00%
Total	0.01%

Budget Impacts			
(Dollars in Millions)	2011-2013	2013-2015	25-Year
General Fund-State	$0.3	$0.3	$7.0
Total Employer	$0.7	$0.8	$17.4

See the Actuarial Results section of this draft fiscal note for additional detail.

WHAT IS THE PROPOSED CHANGE?

Summary Of Change

This proposal impacts the following systems:

- ❖ Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF) Plans 1 and 2.

Heart attacks and strokes suffered by public safety personnel are presumed to be duty-related if they occur under certain circumstances.

1. Law enforcement.

The proposal adds heart attacks and strokes that result in death, and occur while the officer is engaged in a situation involving non-routine strenuous or stressful activity, or within 24 hours of such activity as duty-related conditions.

Detailed criteria for what constitutes non-routine strenuous or stressful activity are listed in the proposal.

2. Fire fighters.

The proposal adds a presumption for strokes suffered by firefighters within:

- ❖ Seventy-two hours of exposure to smoke, fumes, or toxic substances.
- ❖ Twenty-four hours of strenuous physical exertion due to firefighting activities.

The criteria for the presumption are identical to existing criteria in current law.

Effective Date: 90 days after session, and applies retroactively to January 1, 2010.

What Is The Current Situation?

Current law establishes a presumption for heart attacks suffered by firefighters, within the timeframes listed above. The presumption for heart conditions does not apply to regular users of tobacco products, or who have a long history of tobacco use.

Who Is Impacted And How?

We estimate this proposal could affect any of the 17,307 active members of LEOFF. Furthermore, we expect approximately one active member per year will actually receive improved benefits. Also, we expect one current survivor to receive improved benefits.

We estimate this proposal will increase the benefits for a typical survivor by re-classifying their benefits from non-duty related to duty-related death benefits. Duty-related death benefits include:

- The duty-death lump-sum payment, which was worth $214,000 in 2009.
- An unreduced life annuity. For example, the monthly benefit to the survivor of a 45-year old member could increase from $1,046 to $2,500 per month.
- Medical insurance premiums paid for life through the Public Employees' Benefit Board (PEBB). Currently, this costs approximately $5,500 annually for survivors under age 65, and $2,500 for survivors over age 65. If the survivor has an eligible child the cost is approximately $4,500 more per year. Currently, these annual costs are expected to outpace general inflation over the long term by approximately 1.5 percent per year.

WHY THIS PROPOSAL HAS A COST AND WHO PAYS FOR IT

Why This Proposal Has A Cost

This proposal has a cost because it increases the survivor benefits we expect the plan to pay. Consistent with the "Who Is Impacted and How" section, it will increase the number of deaths that are considered duty related, which will increase the following payments to eligible survivors:

- Duty-death lump sum.
- Survivor annuity.
- PEBB premiums.

Who Will Pay For These Costs?

The costs will be shared by members, employers, and the state consistent with the standard LEOFF funding policy:

- LEOFF 1 – Currently no contributions are required under current law when the plan is fully funded. If the plan comes out of full funded status in the future, we assume the state, under prior funding policy, will pay for the increased costs.
- LEOFF 2 - The increased costs will be paid by the members (50 percent), employers (30 percent), and state (20 percent).

HOW WE VALUED THESE COSTS

Assumptions We Made

We assumed law enforcement officers would experience heart attacks at the same rate as currently assumed for firefighters. We also assumed that strokes would occur at the same rate as heart attacks.

For more detail please see Appendix A.

How We Applied These Assumptions

We increased our assumption for duty-related deaths consistent with Appendix A. This increased the assumed number of duty-death lump-sum payments, duty-death survivor annuities, and duty-death PEBB reimbursements in the future.

In addition, we valued the one known survivor that would be eligible for improved benefits immediately. We valued the increased cost as:

- Unreduced back-annuity payments from March 2010 to November 2010, plus
- Unreduced life annuity from November 2010, plus
- Duty-death lump sum, plus
- PEBB premium reimbursements from November 2010 for life, minus
- The accumulated savings fund value to March 2010. This is the assumed benefit that will be foregone if the survivor accepts the more valuable unreduced annuity.

Special Data Needed

We relied on information provided by the Department of Retirement Systems to identify the one known survivor that would be eligible immediately. If there is more than one current eligible survivor, the costs will be higher than assumed in this draft fiscal note.

We also used data from the Department of Labor and Industries (L&I) and the American Heart Association to help set our assumptions, which can be seen in Appendix A.

Otherwise, we developed these costs using the same assets and data as disclosed in the June 30, 2009, Actuarial Valuation Report (AVR).

ACTUARIAL RESULTS

How The Liabilities Changed

This proposal will impact the actuarial funding by increasing the present value of future benefits payable as shown below.

Impact on Pension Liability			
(Dollars in Millions)	**Current**	**Increase**	**Total**
Actuarial Present Value of Projected Benefits *(The Value of the Total Commitment to all Current Members)*			
LEOFF 1	$4,501	$0.0	$4,501
LEOFF 2	7,394	6.9	7,400
LEOFF Total	**$11,895**	**$6.9**	**$11,902**
Unfunded Actuarial Accrued Liability *(The Portion of the Plan 1 Liability that is Amortized According to Funding Policy)**			
LEOFF 1	**($1,111)**	**$0.0**	**($1,111)**
Unfunded PUC Liability *(The Value of the Total Commitment to all Current Members Attributable to Past Service that is Not Covered by Current Assets)*			
LEOFF 1	($1,135)	$0.0	($1,135)
LEOFF 2	(1,215)	5.6	(1,210)
LEOFF Total	**($2,351)**	**$5.6**	**($2,345)**

Note: Totals may not agree due to rounding.

How The Present Value of Future Salaries (PVFS) Changed

This proposal will not impact the actuarial funding by changing the PVFS of the members as shown below.

Present Value of Future Salaries			
(Dollars in Millions)	**Current**	**Increase**	**Total**
Actuarial Present Value of Future Salaries *(The Value of the Future Salaries Expected to be Paid to Current Members)*			
LEOFF 2	**$17,298**	**$0.0**	**$17,298**
UAAL Present Value of Future Salaries *(The Value of the Future Salaries Used to Fund the UAAL)*			
LEOFF 1	$16,187	$0.0	$16,187

Note: Totals may not agree due to rounding.

How Contribution Rates Changed

The rounded increase in the required actuarial contribution rate results in the supplemental contribution rate shown below that applies in the current biennium. However, we will use the un-rounded rate increase to measure the budget changes in future biennia.

Impact on Contribution Rates: (Effective 09/01/2011)	
System/Plan	**LEOFF**
Current Members	
Employee (Plan 2)	0.020%
Employer:	
Normal Cost	0.012%
Plan 1 UAAL	0.000%
Total	0.012%
State	
Current Annual Cost	0.008%
Plan 1 Past Cost	0.000%
Total	0.008%
New Entrants*	
Employee (Plan 2)	0.019%
Employer:	
Normal Cost	0.011%
Plan 1 UAAL	0.000%
Total	0.011%
State	
Current Annual Cost	0.007%
Plan 1 Past Cost	0.000%
Total	0.007%

**Rate change applied to future new entrant payroll and used to determine budget impacts only. Current members and new entrants pay the same contribution rate.*

How This Impacts Budgets And Employees

Budget Impacts		
(Dollars in Millions)	LEOFF	Total
2011-2013		
General Fund	$0.3	$0.3
Non-General Fund	0.0	0.0
Total State	**$0.3**	**$0.3**
Local Government	0.3	0.3
Total Employer	**$0.7**	**$0.7**
Total Employee	**$0.7**	**$0.7**
2013-2015		
General Fund	$0.3	$0.3
Non-General Fund	0.0	0.0
Total State	**$0.3**	**$0.3**
Local Government	0.5	0.5
Total Employer	**$0.8**	**$0.8**
Total Employee	**$0.8**	**$0.8**
2011-2036		
General Fund	$7.0	$7.0
Non-General Fund	0.0	0.0
Total State	**$7.0**	**$7.0**
Local Government	10.4	10.4
Total Employer	**$17.4**	**$17.4**
Total Employee	**$17.4**	**$17.4**

Note: Totals may not agree due to rounding.

The analysis of this proposal does not consider any other proposed changes to the system. The combined effect of several changes to the system could exceed the sum of each proposed change considered individually.

As with the costs developed in the actuarial valuation, the emerging costs of the system will vary from those presented in the AVR or this draft fiscal note to the extent that actual experience differs from the actuarial assumptions.

HOW THE RESULTS CHANGE WHEN THE ASSUMPTIONS CHANGE

To determine the sensitivity of the actuarial results to the best-estimate assumptions or methods selected for this pricing we varied the following assumptions and methods:

- Likelihood of strokes and heart attacks. The table below shows the impact if strokes and heart attacks are 50 percent more likely to occur than currently assumed.

Sensitivity of Rate Impact		
	Best Estimate	50% More Strokes and Heart Attacks
Member	0.020%	0.028%
Employer	0.012%	0.017%
State	0.008%	0.011%

ACTUARY'S CERTIFICATION

The undersigned hereby certifies that:

1. The actuarial cost methods are appropriate for the purposes of this pricing exercise.
2. The actuarial assumptions used are appropriate for the purposes of this pricing exercise.
3. The data on which this draft fiscal note is based are sufficient and reliable for the purposes of this pricing exercise.
4. Use of another set of methods, assumptions, and data may also be reasonable, and might produce different results.
5. We prepared this draft fiscal note for the Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement Board.
6. We prepared this draft fiscal note and provided opinions in accordance with Washington State law and accepted actuarial standards of practice as of the date shown on page one of this draft fiscal note.

While this draft fiscal note is meant to be complete, the undersigned is available to provide extra advice and explanations as needed.

Matthew M. Smith, FCA, EA, MAAA
State Actuary

APPENDIX A – ASSUMPTIONS WE MADE

We made two main assumptions for this pricing:

- ❖ Law enforcement officers will experience heart attacks at the same expected rate as firefighters.
- ❖ All plan members will experience strokes at the same expected rate as heart attacks.

Based on these two assumptions, we increased our current duty-related death assumption accordingly.

The duty-related death assumption began as 0.0376 percent. This includes an assumption of 0.0280 for law enforcement officers (57 percent of the population) and 0.0504 for firefighters (43 percent of the population). We increased the rate in the following steps:

1. Assuming law enforcement officers will experience heart attacks at the same expected rate as firefighters, we increased the law enforcement rate by 13 percent. This brought the law enforcement rate up to 0.0316 percent.
2. Assuming strokes for firefighters occur at the same rate as heart attacks for firefighters, we increased the firefighter rate by 13 percent. This brought the firefighter rate up to 0.0570.
3. Assuming strokes for law enforcement officers occur at the same rate as heart attacks for law enforcement officers, we increased the law enforcement rate by an additional 13 percent. This brought the law enforcement rate up to 0.0353.
4. Blending the two rates together, we estimated an overall duty-death rate of 0.0446 percent.

We relied on the following two sources of data to help set our assumption:

1. **American Heart Association (AHA) statistics** – We used two sets of statistics from an AHA report. First, it showed the general public experienced strokes at a slightly higher rate than heart attacks (6.5 million versus 5.8 million). It also showed a similar statistic for the general public under the age of 60. However, it also notes that physically active people have a significant reduction in the likelihood of strokes. Based on this information, we believe an equal likelihood of stroke and heart attack was reasonable for police and fire fighters.
2. **L&I data** – The Department of Labor and Industries (L&I) provided us with data on members who may have qualified for this standard in the past. The data they provided had more members with heart attacks than strokes. However, their data was very limited and they cautioned our use of it. So we only used this as a "reasonability-check" of our assumption where we lower the general public's stroke versus heart attack ratio to equally likely for police and fire fighters. We show the potential impact to the system if we assume

strokes and heart attacks occur more frequently than currently assumed in the "How the Results Change When the Assumptions Change" section.

Otherwise, we developed these costs using the same assumptions as disclosed in the AVR.

GLOSSARY OF ACTUARIAL TERMS

Actuarial Accrued Liability: Computed differently under different funding methods, the actuarial accrued liability generally represents the portion of the present value of fully projected benefits attributable to service credit that has been earned (or accrued) as of the valuation date.

Actuarial Present Value: The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of actuarial assumptions (i.e. interest rate, rate of salary increases, mortality, etc.).

Aggregate Funding Method: The Aggregate Funding Method is a standard actuarial funding method. The annual cost of benefits under the Aggregate Method is equal to the normal cost. The method does not produce an unfunded actuarial accrued liability. The normal cost is determined for the entire group rather than on an individual basis.

Entry Age Normal Cost Method (EANC): The EANC method is a standard actuarial funding method. The annual cost of benefits under EANC is comprised of two components:

- Normal cost.
- Amortization of the unfunded actuarial accrued liability.

The normal cost is determined on an individual basis, from a member's age at plan entry, and is designed to be a level percentage of pay throughout a member's career.

Normal Cost: Computed differently under different funding methods, the normal cost generally represents the portion of the cost of projected benefits allocated to the current plan year.

Projected Unit Credit (PUC) Liability: The portion of the Actuarial Present Value of future benefits attributable to service credit that has been earned to date (past service).

Projected Benefits: Pension benefit amounts that are expected to be paid in the future taking into account such items as the effect of advancement in age as well as past and anticipated future compensation and service credits.

Unfunded PUC Liability: The excess, if any, of the Present Value of Benefits calculated under the PUC cost method over the Valuation Assets. This is the portion of all benefits earned to date that are not covered by plan assets.

Unfunded Actuarial Accrued Liability (UAAL): The excess, if any, of the actuarial accrued liability over the actuarial value of assets. In other words, the present value of benefits earned to date that are not covered by plan assets.